

Allostratigraphic Analysis of the Middle Jurassic in Southern Saskatchewan

Mike Blair and Katherine Bergman
University of Regina

Middle Jurassic regional stratigraphy in southern Saskatchewan is poorly defined and has been complicated throughout recent history by various stratigraphic classifications based on localized oilfield studies and correlations to distant outcrops in the U.S.A. The Middle Jurassic changes from carbonate-dominated to siliciclastic-dominated sedimentation from west to east across the province. The Middle Jurassic sediments of Saskatchewan were deposited on a shallowly dipping shelf in the large embayment that covered the Williston Basin area. The lower Gravelbourg member is a dominantly shallow marine carbonate mudstone that is erosionally overlain by regionally extensive oolitic shoal deposits (<35 m thick). An apparent rise in base level, resulted in the deeper water deposits of the upper Gravelbourg member, represented by calcareous mudstone in southwestern Saskatchewan grading into non-calcareous, organic-rich shale with siltstone and sandstone interbeds, toward the eastern side of the province. Following the deposition of the upper Gravelbourg member there was a significant base level fall that produced a regionally extensive incised valley system trending roughly from northeast to southwest. This incised valley system (<35 m thick) was previously unreported and may form hydrocarbon reservoirs toward the eastern part of southern Saskatchewan. After this base level fall the Williston Basin area was flooded again depositing the carbonate-dominated Shaunavon Formation sediments in southwestern Saskatchewan and siliciclastic dominated sediments in the southeast. The influx of siliciclastic sediment in the east resulted in the designation of a new formation for the time equivalent Middle Jurassic, upper Gravelbourg member and Shaunavon Formation in southwestern and central Saskatchewan. This new formation termed the Red Jacket Formation was necessary in accounting for the facies changes caused by a large-scale influx of fluvial sediments from the northeast. This study attempts to provide a better understanding of the facies changes from south central to eastern Saskatchewan there by clarifying the discrepancies in Middle Jurassic stratigraphy in southern Saskatchewan from west to east.